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(54) NEAR-IR SHIELDING FILM

(57) Abstract:

**PROBLEM TO BE SOLVED:** To provide a near-IR shielding film suitable to be used for an optical filter for a plasma display or the like, having high near-IR shielding property and also visible ray transmitting property, superior in color balance of transmitted color, having practical durability, superior in productivity, and capable of selectively cutting unwanted light in the visible ray region to improve the

image quality.

**SOLUTION:** This film has a multilayered structure formed by laminating a transparent resin film layer, transparent near-IR shielding layer containing a diimmonium compound as a near-IR absorbing dye as the essential component, transparent resin film layer, and transparent tone adjusting layer containing a coloring material for compensating the color tone of the transparent near-IR shielding layer.

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**DETAILED DESCRIPTION**

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**[Detailed Description of the Invention]****[0001]**

**[Field of the Invention]** This invention relates to the near infrared ray electric shielding film used suitable for especially the light filter for plasma displays about a near infrared ray electric shielding film.

**[0002]**

**[Description of the Prior Art]** Wavelength which is emitted from the former, for example, a plasma display, and causes [ of surrounding electronic equipment ] malfunction The following is used for electric shielding of the near infrared ray of 850 - 1000 nm, or it is proposed.

(1) Carry out the multilayer laminating of a metallic-oxide thin film and the metal thin film on a transparency base material, and while the light penetrates using the reflection property of the light of a metal thin film, reflect and cover the light of a near infrared ray field.

(2) What carries out the multilayer laminating of the thin film with which refractive indexes differ, reflects the light of a specific near infrared ray field on a transparency base material using the interferential action of light, and is covered.

(3) What absorbs the light of a near infrared ray field by the absorptivity of a copper ion, and is covered with the sheet which carried out the casting polymerization of the compound containing a copper ion to acrylic resin.

(4) What is made to distribute a near infrared ray absorbent in thermoplastics, carries out thermoforming to the shape of a sheet, and absorbs and covers the light of a near infrared ray field.

(5) What carries out coating of the resin constituent containing a near infrared ray absorbent to the shape of a sheet on cast shaping or a transparency base material, and absorbs and covers the light of a near infrared ray field.

**[0003]** **[Trouble]** However, there were the respectively following troubles in the aforementioned near infrared ray shielding material for plasma displays. Namely, the above (1) and (2) About the near infrared ray shielding material for plasma displays, by selection, each optical thickness, and the count of a laminating of a thin film material, an optical property can be designed freely and desired near infrared ray shielding property can be obtained. However, in order to obtain the advanced electric shielding nature for preventing malfunction of a peripheral device, it is necessary to prepare the layer which needs to make [ many ] the count of a laminating, and otherwise contains a near infrared ray absorbent when there are few counts of a laminating, and to compensate electric shielding nature, a manufacturing cost becomes very high, and versatility is missing. Moreover, with enlargement of a display, when the membrane formation to the further large area is required, it describes above. (1) and (2) With an optical thin film system ingredient [ like ], since the highly precise homogeneity within a field is required, manufacture becomes difficult.

**[0004]** Above (3) About the near infrared ray shielding material for plasma displays, since the absorbing power of the near infrared ray of a copper ion is low, in order to obtain advanced electric shielding nature, thickness of a sheet cannot be made thin, but in order for shaping of a sheet to also put an one-

sheet one-sheet prepolymer into a mold and to carry out a polymerization, a manufacturing cost becomes high. Moreover, since the transparency color of the sheet itself becomes blue in order to also absorb greatly a part for the light-emitting part of the red of a light field, and a color-balance is spoiled, it is not desirable as a filter for a display.

[0005] Above (4) About the near infrared ray shielding material for plasma displays, when control of an optical property can carry out comparatively easily and carries out extrusion molding of the resin which carried out heating fusion from a slit die by selection of the near infrared ray absorbent distributed in thermoplastics, manufacturing cheaply in large quantities is possible. However, since thermal resistance is inferior in the near infrared ray absorbent excellent in both light permeability and near infrared ray absorptivity generally, the manufacture which deteriorated at the process by which heating melting is carried out, and was stabilized is difficult with resin, and when coloring matter excellent in thermal resistance is used, the permeability of a light field becomes low and the brightness fall of a display becomes large.

[0006] Above (5) About the near infrared ray shielding material for plasma displays, it is the above (4). The deterioration by the heat in the near infrared ray shielding material for plasma displays is avoidable, and its manufacturing cost is also the cheapest and it is excellent in productivity. However, as a near infrared ray absorbent, although the proposal of the combination of various near infrared ray absorbents, such as a G MONIUMU system compound, an aminium system compound, a phthalocyanine system compound, an organometallic complex, a cyanine system compound, an azo compound, a poly methine system compound, a quinone system compound, a diphenylmethane system compound, a triphenylmethane color system compound, and a mercapto naphthol system compound, is performed, in order to obtain advanced electric shielding nature, the permeability of the light is not enough in spoiling the color-balance of a transparency color remarkably. Moreover, when long duration use of the ingredient concerned is carried out whenever [ high-humidity/temperature ] on the bottom or the outdoors, the electric shielding nature of a near infrared ray falls by decomposition or deterioration, or the color-balance of a transparency color is spoiled remarkably, and practicality is missing in respect of endurance, such as moisture resistance, thermal resistance, and lightfastness.

[0007]

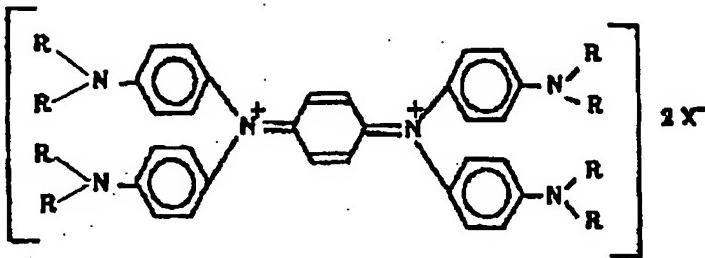
[Problem(s) to be Solved by the Invention] It has practical endurance, and its productivity is good, and it is offer the near infrared ray electric shielding film which covers the unnecessary light of a light field alternatively further, and may raise image quality while use for the light filter for plasma displays etc. the technical problem which this invention was made in view of the trouble which said Prior art has, and was set up concretely for the reason, have suitable advanced near infrared ray shielding property and light permeability and be excellent in the color-balance of a transparency color.

[0008]

[Means for Solving the Problem] The near infrared ray electric shielding film concerning claim 1 in this invention as technical means concretely constituted so that said technical problem could be solved effectively A transparence resin film layer (1) and the transparence near infrared ray shielding layer which contains a G MONIUMU system compound as an indispensable component as a near infrared ray absorbent (2), It is characterized by having the multilayer structure which carried out the laminating of a transparence resin film layer (3) and the transparence color tone compensation layer (4) containing the color material which rectifies the color tone of said transparence near infrared ray shielding layer (2).

[0009] The near infrared ray electric shielding film applied here at claim 2 is characterized by expressing said G MONIUMU system compound with the following general formula.

[Formula 2]



(Anion with which R is the same or a radical chosen from the hydrogen which is different from each other, an alkyl group, an aryl group, a hydroxy group, a phenyl group, and an alkyl halide radical mutually among a formula, and X is chosen from perchloric acid ion, fluoride boron acid ion, hexafluoro arsenate, hexafluoro antimonic acid ion, trifluoroacetic acid ion, picric-acid ion, benzenesulfonic acid ion, phosphoric-acid ion, sulfate ion, and chloride ion)

Moreover, the near infrared ray electric shielding film concerning claim 3 is wavelength. The permeability of the near infrared ray of 850 - 1000 nm It is below 10 % and the average transmission coefficient of a visible ray It is more than 65 %, and is  $L^* a^* b^*$ . The color tone in a color coordinate system is characterized by being  $-3 \leq a^* \leq 3$  and  $-3 \leq b^* \leq 3$ . Moreover, as for said transparency near infrared ray shielding layer (2), and said transparency resin film layer (3) and said transparency color tone compensation layer (4), the near infrared ray electric shielding film concerning claim 4 is characterized by coming to carry out a laminating to this order. [ said transparency resin film layer (1), and ]

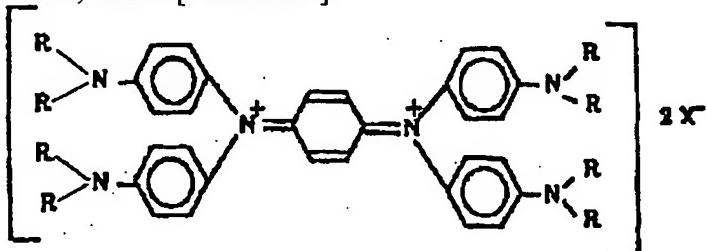
[0010] Furthermore, a glass transition point the near infrared ray electric shielding film concerning claim 5 It is characterized by being thermoplastics more than 70 \*\*. [ the resin which forms said transparency near infrared ray shielding layer (2) and/or said transparency color tone compensation layer (4) ] Furthermore, the near infrared ray electric shielding film concerning claim 6 is characterized by said thermoplastics being polyester system resin or acrylic resin. Furthermore, the near infrared ray electric shielding film concerning claim 7 is characterized by the melting point of said G MONIUMU system compound being more than 190 \*\*. Furthermore, for the near infrared ray electric shielding film concerning claim 8, said color material is wavelength. It is characterized by being the color material which absorbs a 560-590nm visible ray alternatively. Furthermore, it is characterized by the near infrared ray electric shielding film concerning claim 9 carrying out the laminating of the transparency adhesive layer (5) containing an ultraviolet ray absorbent to aforementioned both sides or aforementioned one side of a near infrared ray electric shielding film, and coming to carry out the laminating of the mold releasing film layer (6) on it.

[0011] [Embodiment of the Invention] The near infrared ray electric shielding film concerning the gestalt of this operation As shown in drawing 1, coating of the resin constituent which contains the G MONIUMU system compound expressed in said general formula as the transparency resin film layer 1 as a near infrared ray absorbent as an indispensable component is carried out on said transparency resin film layer 1. Formation and the transparency near infrared ray shielding layer 2 by which the laminating was carried out, On this transparency near infrared ray shielding layer 2, formation and the transparency resin film layer 3 by which the laminating was carried out, Coating of the resin constituent containing the color material which rectifies the color tone of said transparency near infrared ray shielding layer 2 is carried out. Formation and the transparency color tone compensation layer 4 by which the laminating was carried out, An ultraviolet ray absorbent is contained and it has the multilayer structure which becomes the upper layer (drawing 1 lower layer) of said transparency resin film layer 1 from formation and the mold releasing film layer 6 by which the laminating was carried out at formation, the transparency adhesive layer 5 by which the laminating was carried out, and the upper layer (drawing 1 lower layer) of this transparency adhesive layer 5.

[0012] By having made it such a configuration, near infrared ray shielding property and light

permeability practical [ a near infrared ray electric shielding film ] as a near infrared ray electric shielding filter for plasma displays and advanced, and the film which has the outstanding color-balance are obtained. Here, the transparency adhesive layer 5 and the mold releasing film layer 6 do not necessarily need to be formed here at the transparency resin film layer 1 side, and may carry out the laminating of the transparency adhesive layer 5 and the mold releasing film layer 6 to this order at the transparency color tone compensation layer 4 top.

[0013] A G MONIUMU system compound is a compound expressed with the following general formula, and is [Formula 3].



R is mutually the same -- or -- difference -- hydrogen and an alkyl group (a methyl group and an ethyl group --) Aryl groups, such as a propyl group and butyl, a hydroxy group, a phenyl group, It is an alkyl halide radical etc. X Perchloric acid ion, fluoride boron acid ion, Hexafluoro arsenate, hexafluoro antimonic acid ion, trifluoroacetic acid ion, Picric-acid ion, benzenesulfonic acid ion, phosphoric-acid ion, sulfate ion, It is chloride ion etc. and N, N, N', an N'-tetrakis (p-diethylaminophenyl)-para benzoquinone-bis(potato NIUMU) hexafluoro antimonate, etc. can specifically be illustrated. These are the Nippon Kayaku Co., Ltd. make, although it can also be used compounding suitably. IRG-022, IRG-040, Japan Carlit Co., Ltd. make CIR-1080, CIR-1081, and CIR-1083 grade are marketed and it is also possible to use them.

[0014] For these G MONIUMU system compounds, molar extinction coefficient epsilon is abbreviation to a near infrared region. 10 It has the big absorption which is about 10,000, and is wavelength.

Although the light field of 400 - 500 nm has absorption a little and the color tone of a thin yellowish brown color - green is presented, since light permeability is superior to other near infrared ray absorbents, it uses for said near infrared ray electric shielding film, and is suitable. The loadings of a G MONIUMU system compound are wavelength in order to discover the malfunction prevention function of enough peripheral devices, although it is dependent on the thickness of the transparency near infrared ray shielding layer 2 containing this near infrared ray absorbent. The near infrared ray permeability of 850 - 1000 nm It is necessary to make it become below 10 %. For that purpose, thickness of the transparency near infrared ray shielding layer 2 5-50 Loadings of the near infrared ray absorbent to resin solid content when it designs as a mum grade 0.3-5.0 What is necessary is just to consider as weight % extent. Since the superfluous combination of a near infrared ray absorbent to the resin which forms the transparency near infrared ray shielding layer 2 causes the segregation of said near infrared ray absorbent in the inside of the transparency near infrared ray shielding layer 2, and the fall of light permeability, it is not desirable.

[0015] Moreover, wavelength Said G MONIUMU system compound and other near infrared ray absorbents may be blended, the near infrared ray of 850 - 900 nm may be covered, and it is wavelength in this case. Organometallic complexes, the phthalocyanine system compound which has the absorption maximum, a dithiol nickel complex, for example, a bis(dithio benzyl) nickel complex etc., etc., etc. may be used near 850nm. However, it is better for it to be better to blend these near infrared ray absorbents with the transparency color tone compensation layer 4, and to blend a G MONIUMU system compound independently in the transparency near infrared ray shielding layer 2 concerned, since it has the catalysis which the permeability of the former of a light field is low, and the latter returns a G MONIUMU system compound, and is deteriorated.

[0016] Moreover, the melting point a G MONIUMU system compound to give practical endurance It is

desirable to use a thing 190 degrees C or more. The melting point That it is easy to deteriorate downward whenever [ high-humidity/temperature ], the thing of 190 or more degrees C can combine a thing 190 degrees C or less with selection of the below-mentioned suitable resin kind, and it can acquire practically good endurance.

[0017] In order to give practical endurance, a glass transition point the resin which forms the transparency near infrared ray shielding layer 2 and/or the transparency color tone compensation layer 4 It is thermoplastics more than 70 \*\*, and it is desirable that they are polyester system resin or acrylic resin, and the resin of fusibility is preferably good for general-purpose solvents, such as toluene, a methyl ethyl ketone, and methyl isobutyl ketone. The glass transition point of this resin When it is put to the elevated temperature on the front face of a plasma display for a long time that it is under 70 \*\*, the G MONIUMU system compound in the transparency near infrared ray shielding layer 2 tends to receive deterioration at the same time resin becomes soft, and a problem is in long-term stability -- a color-balance is spoiled or the electric shielding nature of a near infrared ray falls. On the other hand, a glass transition point If it is more than 70 \*\*, it will become possible to control deterioration by heat. On the other hand, since the activity reaction radical contained in a component reacts with a G MONIUMU system compound and the optical property of a paint film is spoiled remarkably, the resin of heat-curing molds, such as an epoxy system and an urethane system, cannot be used. As resin which satisfies the above requirements, polyester system resin, acrylic resin, etc. are used suitably.

[0018] Although the transparency resin film which constitutes the transparency resin film layer 1 and the transparency resin film layer 3 is not limited especially if there is no trouble in light transmission nature when the laminating of aforementioned each class is carried out, a polyester system, acrylic, a polycarbonate system, a cellulose system, an urethane system, etc. are mentioned, and a polyester system and its acrylic are desirable in respect of a refractive-index difference with the transparency near infrared ray shielding layer 2 or the color tone compensation layer 4. Moreover, the thickness of the transparency resin film which constitutes the transparency resin film layer 1 and the transparency resin film layer 3 has desirable 10-125 micrometers from the field of workability and the Hayes value.

[0019] In order to carbonate the color tone of the yellowish brown color of said transparency near infrared ray shielding layer 2 containing said G MONIUMU system compound - green and to prepare a color-balance, as for the transparency color tone compensation layer 4, it is desirable to contain color material which serves as those complementary color. As this color material, general things, such as an inorganic system pigment, an organic system pigment, an organic system color, and coloring matter, are mentioned. As an inorganic pigment, a cobalt compound, an iron compound, a chromium compound, etc. are mentioned. As an organic pigment Azo, an in DORINON system, the Quinacridone system, a bat system, a phthalocyanine system, a naphthalocyanine system, etc. are mentioned. To said organic system color and coloring matter azo, an azine system, an anthraquinone system, and indigo -- the id, although a system, an oxazine system, a kino FUTARON system, a SUKUWARIUMU system, a stilbene system, a triphenylmethane color system, a naphthoquinone system, a PIRAROZON system, a poly methine system, etc. are mentioned An organic system pigment is suitably used from the balance of color enhancement and endurance among these.

[0020] Moreover, it is wavelength as the aforementioned color material. By using for the visible-ray field of 560 - 590 nm the color material which has absorption alternatively, it is desirable to add the function which covers the unnecessary light by luminescence of the neon gas from a plasma display, improves color purity, and improves image quality. An organic system pigment like for example, dimethyl Quinacridone is mentioned to such a color material. And it is wavelength in color material. By blending with the field of 850 - 900 nm organometallic complexes, such as a dithiol nickel complex which has the absorption maximum, it is desirable to complement near infrared ray shielding property. And the loadings of several of these sorts of color material are L\* a\*b\* of the near infrared ray electric shielding film concerned. What is necessary is just to determine loadings from the thickness, the amount of resin solid content, and the amount of color material of said transparency color tone compensation layer (4) so that the color tone in a color coordinate system may be set to -3 <=a\* <=3 and -3 <=b\* <=3.

[0021] Moreover, in fact, in order to use it, carrying out the laminating of said near infrared ray electric

shielding film to other electromagnetic wave shielding films, a reflective antistatic film, etc., when the transmission loss by lamination is taken into consideration, it is desirable [ when using a near infrared ray electric shielding film as a light filter for plasma displays, as for the average transmission coefficient of the light, it is desirable to consider as 50 - 60 % from the brightness of a screen and the balance of contrast, but ] that they are the light average transmission coefficient of a near infrared ray electric shielding film and more than 65 %. Moreover, in order to improve the moisture resistance and thermal resistance of resin which form a paint film if needed to the transparency near infrared ray shielding layer concerned, a transparency color tone adjustment layer, and a transparency adhesive layer, the antioxidant generally used may be added. Although there are an aromatic amine system, a hindered phenol system, etc. in an antioxidant and various things are marketed, it tends to color and the thing of the former of a hindered phenol system is desirable.

[0022] It is desirable to form the transparency adhesive layer 5 as an ultraviolet-rays shielding layer which blended the ultraviolet ray absorbent with the binder etc. in them, in order to prevent deterioration of the G MONIUMU system compound by ultraviolet-rays light in one of one side or both sides of a near infrared ray electric shielding film and to improve lightfastness to them. A benzophenone system, a benzotriazol system, etc. are mentioned as an ultraviolet ray absorbent. Moreover, this near infrared ray electric shielding film can be easily stuck on a transparency base material, for example, filter base material etc., through the transparency adhesive layer 5. Furthermore, when carrying out the laminating of the transparency adhesive layer 5, it is desirable to stick the mold releasing film layers 6, such as a polyethylene system, on the upper layer (adhesive face) in respect of workability.

[0023] The near infrared ray electric shielding film concerning the gestalt of this operation can be manufactured as follows, for example. First, the transparency resin film A with which the resin which forms the transparency near infrared ray shielding layer 2 was applied to the solvent with the G MONIUMU system compound of the specified quantity etc. on the dissolution or the transparency resin film which carries out distributed processing, prepares a resin constituent, and constitutes the transparency resin film layer 1 for this resin constituent using the usual coating equipments, such as a bar coating machine, a roll coater, and a slit-die coating machine, desiccation evaporation of the solvent was carried out, and the laminating of the near infrared ray shielding layer 2 was carried out is formed. The transparency resin film B with which the resin which forms the transparency color tone compensation layer 4 applied to the solvent with said color material for color tone adjustment etc. on the other hand on the dissolution or the transparency resin film which carries out distributed processing, prepares a resin constituent, and constitutes the transparency resin film layer 3 for this resin constituent using the usual coating equipments, such as a bar coating machine, a roll coater, and a slit-die coating machine, desiccation evaporation of the solvent carried out, and the laminating of the color tone compensation layer 4 was carried out forms. In addition, mean particle diameter of color material 0.01-10 It is desirable from the field of transparency, color enhancement, and the stability of a resin constituent with the passage of time that it is within the limits of mum.

[0024] Subsequently, the laminating of the transparency resin film A and the transparency resin film B is carried out. Under the present circumstances, as for the lamination of both the transparency resin film, it is desirable to carry out a heating lamination at the temperature more than the softening temperature of the resin with which the near infrared ray shielding layer 2 and the color tone compensation layer 4 of the transparency resin film B make the field by which a laminating is not carried out meet, and form the near infrared ray shielding layer 2. In this case, when the fault which the color tone compensation layer 4 softens similarly, and welds to a heat roll arises, the heating lamination of the transparency resin film A and the transparency resin film which constitutes the transparency resin film layer 3 is carried out beforehand, and the laminating of the color tone adjustment layer 4 may be carried out to a transparency resin film front face after that. Moreover, even if it carries out the sequential lamination of the transparency resin film A and the transparency resin film B and makes it the above-mentioned laminating gestalt, it does not interfere with the front face of a transparency base material, for example, the front-face plate of a plasma display.

[0025] In addition, when the near infrared ray shielding layer 2 of the transparency resin film A and the

color tone compensation layer 4 of the transparency resin film B are made to meet and a laminating is carried out, or when the laminating of the transparency resin film A and the transparency resin film B is carried out so that the near infrared ray shielding layer 2 may be exposed, and the transparency adhesive layer 5 is formed on the near infrared ray shielding layer 2, in any case, deterioration of a G MONIUMU system compound tends to be promoted whenever [ high-humidity/temperature ] in the bottom. Thus, the manufactured near infrared ray electric shielding film can be used suitable [ other than the light filter for plasma displays ] for for example, the heat ray electric shielding glass for automobiles, multiple glass, etc.

[0026]

[Example] Hereafter, an example and the example of a comparison are explained concretely. In addition, the measuring method of the optical property of a sample with which the laminating of the near infrared ray electric shielding film obtained in each example and the example of a comparison was carried out, and the evaluation approach of endurance are as follows.

(Measurement of total light transmission and the Hayes value) Hazemeter made from Tokyo Denshoku Industry MODEL TC-H3DPK It used and started from each sample. The total light transmission T of the test piece of a 60 x 60 mm angle and the Hayes value H were measured. Each numeric value carried out comparison contrast of the permeability of indoor air, and the Hayes value.

[0027] (Measurement of a color tone) Color analyzer made from Tokyo Denshoku Industry It started from each sample using TOPSCAN TC-1800-MK II. L\* a\* b\* of the test piece of a 60 x 60 mm angle L\* of a color coordinate system, a\*, and b\* The value was measured. In addition, it measured at D65 and \*\*2 degrees of incident angles as a standard light.

[0028] (Measurement of spectral transmittance) Spectrophotometer by Jasco Corp. V-570 It used and started from each sample. Test piece of a 60 x 60mm angle The permeability T850 in 850nm, 900 nm, and 1000 nm, T900, and T 1000 It measured. Each numeric value considered the permeability of indoor air as comparison contrast.

[0029] (Damp-proof evaluation) the Tokyo Rikakikai Co., Ltd. make -- constant temperature -- constant humidity tester KCH-1000 using -- temperature 60 \*\* and humidity it is set as 90 %RH -- 1000 The variation of each measured value of T of each sample after a time amount trial, H, L\*, a\*, b\*, T850, T900, and T1000 made the thing of less than two points O, and made the thing of two points or more x.

[0030] (Heat-resistant evaluation) the Isuzu Factory constant temperature humidistat -- using -- temperature it is set as 80 \*\* -- 1000 T of each sample after a time amount trial, H, L\*, a\*, b\*, T850, T900, and T 1000 The variation of each measured value made the thing of less than two points O, and made the thing of two points or more x.

[0031] (Light-fast evaluation) xenon fade meter made from HEREUSU SUNTEST CPS+ using -- illuminance 500 W/m<sup>2</sup> and temperature it is set as 60 \*\* -- the variation of each measured value of T of each sample after a 400-hour trial, H, L\*, a\*, b\*, T850, T900, and T1000 made the thing of less than two points O, and made the thing of two points or more x. In addition, when an ultraviolet absorption layer was prepared only in one side, it examined so that ultraviolet rays might be irradiated from an ultraviolet absorption layer side.

[0032] [Example 1] Commercial saturation copolymerized polyester resin (glass-transition-temperature 70 \*\*) : 15 Weight section, as a near infrared ray absorbent -- a G MONIUMU system compound (N, N, N', and N' -- a - tetrakis (p-diethylaminophenyl)-para benzoquinone-bis(potato NIUMU) hexafluoro antimonate --) Melting point 200 degree-C:0.2 About the weight section, they are 1:1 partially aromatic solvents of a methyl ethyl ketone and toluene. : 84.8 The resin constituent which carried out dissolution mixing in the weight section The thickness of a dry paint film on a commercial polyethylene terephthalate film (48-micrometer thickness) 20 Transparency resin film with which coating was carried out so that it might be set to mum, and the laminating of the near infrared ray shielding layer which contains a G MONIUMU system compound as a near infrared ray absorbent was carried out A1 It obtained.

[0033] Moreover, said saturation copolymerized polyester resin (glass-transition-temperature 70 \*\*) : 15 Weight section, It is a bis(dithio benzyl) nickel complex as a near infrared ray absorbent. : 0.15 Weight

section, Purple organic system pigment which carried out distributed processing beforehand (FastogenSuper Violet RN by Dainippon Ink & Chemicals, Inc.) : 0.05 The weight section and blue organic system pigment (Lionol Blue ES by TOYO INK MFG. CO., LTD.) : 0.025 weight section 1:1 partially aromatic solvents of a methyl ethyl ketone and toluene: 84.775 The resin constituent which carried out dissolution mixing in the weight section The thickness of a dry paint film on said polyethylene terephthalate film (48 mum thickness) 10 Transparency resin film with which coating was carried out so that it might be set to mum, and the laminating of the color tone compensation layer was carried out B1 It obtained.

[0034] Subsequently, this transparency resin film B1 On said color tone compensation layer, it is an ultraviolet ray absorbent (TINUVIN 384 made from tiba SUPESHARUTI KEMIKARUZU). : 2.7 weight section, Anti-oxidant (product made from tiba SUPESHARUTI KEMIKARUZU IRGANOX-1010) : The 0.9 weight sections, Acrylic binder (Toagosei Aron S-1601) : 96.4 The thickness of a dry paint film the mixture which mixed and obtained the weight section 15 The laminating of the transparency adhesive layer which carries out coating and contains an ultraviolet ray absorbent so that it may be set to mum was carried out.

[0035] Color tone adjustment film which performed this adhesion processing B1 About an adhesive face, it is thickness by the roll laminator. It sticks on a 3mm tempered glass base material. Furthermore, G MONIUMU system compound coating film A1 So that the coating side of a G MONIUMU system compound coating film and the transparency resin film plane of a color tone adjustment film may meet It is temperature to a tempered glass base material. The sample 1 which carries out a heating lamination at 140 degrees C and by which the laminating of the near infrared ray electric shielding film as an example 1 was carried out on the tempered glass base material was obtained. The initial optical property of this sample 1 and the optical property after each durability test were measured, respectively, and that result was summarized in Table 1.

[0036] [Example 2] Commercial acrylic resin (glass transition temperature 105 degrees C) : 15 Weight section, It is a G MONIUMU system compound (Nippon Kayaku Co., Ltd. make IRG-040, the melting point 246 degrees C) as a near infrared ray absorbent. : The 0.3 weight sections 1:1 partially aromatic solvents of a methyl ethyl ketone and toluene: 84.7 The thickness of a dry paint film the resin constituent which carried out dissolution mixing on a commercial Pori methacrylic resin film (50 mum thickness) in the weight section 20 Coating is carried out so that it may be set to mum. Transparency resin film with which the laminating of the near infrared ray shielding layer containing a near infrared ray absorbent G MONIUMU system compound was carried out A2 was obtained.

[0037] Next, this transparency resin film A2 Said near infrared ray shielding layer is minded for said another Pori methacrylic resin film (50 mum thickness), and it is temperature. The heating lamination was carried out at 180 degrees C, and the laminate film was obtained. Subsequently, said acrylic resin: 15 Weight section, The purple organic system pigment which carried out distributed processing beforehand (Fastogen Super Violet RN by Dainippon Ink & Chemicals, Inc.): The 0.05 weight sections and blue organic system pigment (Lionol Blue ES by TOYO INK MFG. CO., LTD.) : The 0.025 weight sections 1:1 partially aromatic solvents of a methyl ethyl ketone and toluene The thickness of a dry paint film the resin constituent which carried out dissolution mixing on said laminate film in the 84.925 weight sections 10 Laminate film with which coating was carried out so that it might be set to mum, and the laminating of the color tone adjustment layer was carried out B-2 It obtained.

[0038] On this color tone adjustment layer, on the surface of a mold releasing film (polyethylene film), beforehand Furthermore, the ultraviolet ray absorbent (TINUVIN 384 made from tiba SUPESHARUTI KEMIKARUZU):2.7 weight section, Anti-oxidant (product made from tiba SUPESHARUTI KEMIKARUZU IRGANOX-1010) : The 0.9 weight sections, Acrylic binder (Toagosei Aron S-1601) : 96.4 The mixture which mixed and obtained the weight section The thickness of a dry paint film 15 The adhesive face containing the ultraviolet ray absorbent of the mold releasing film which carried out coating so that it might be set to mum was stuck with the roll laminator, and was used as the near infrared ray electric shielding film as an example 2. It is thickness, exfoliating said mold releasing film in the near infrared ray electric shielding film of this example 2 using roll laminator equipment. It stuck

on the 3mm tempered glass base material, and considered as the sample 2. The initial optical property of this sample 2 and the optical property after each durability test were measured, respectively, and that result was summarized in Table 1.

[0039] [Example 3] Organic system pigment used for the color tone adjustment layer 4 (Clariant Japan Hostaparm Red-Violet ER -02) : According to the example 1, the sample 3 by which the laminating of the near infrared ray electric shielding film as an example 3 was carried out on the tempered glass base material was obtained except having used the 0.075 weight sections. The initial transparency spectrum of this sample 3 was shown in drawing 2. Moreover, the initial optical property of this sample 3 and the optical property after each durability test were measured, respectively, and that result was summarized in Table 1.

[0040] [Example 1 of a comparison] Commercial saturation copolymerized polyester resin (glass-transition-temperature 65 \*\*) : 15 Weight section, the G MONIUMU system compound (N, N, N', and N' -- a - tetrakis (p-diethylaminophenyl)-para benzoquinone-bis(potato NIUMU) hexafluoro antimonate --) of a near infrared ray absorbent Melting point 200 degrees C : The 0.2 weight sections, bis(dithio benzyl) nickel complex of a near infrared ray absorbent: 0.20 Weight section, Phthalocyanine system compound of a near infrared ray absorbent: 0.10 The weight section 1:1 partially aromatic solvents 84.8 of a methyl ethyl ketone and toluene The thickness of a dry paint film the resin constituent which carried out dissolution mixing on a commercial polyethylene terephthalate film (48 mum thickness) in the weight section 20 Coating was carried out so that it might be set to mum.

[0041] Subsequently, coating was carried out to the coating side of this film, and the field of the opposite side, and adhesion processing was performed to them so that it might be set to ultraviolet ray absorbent ( TINUVIN 384 made from tiba SUPESHARUTI KEMIKARUZU):mum. The 2.7 weight sections, antioxidant (IRGANOX-1010) : 0.9 weight section, acrylic binder (Toagosei Aron S-1601) : 96.4 The thickness of a dry paint film the mixture which mixed and obtained the weight section 15 About the adhesive face of the film which performed this adhesion processing, it is thickness by the roll laminator. It stuck on the 3mm tempered glass base material, and considered as the sample 4. The initial optical property of this sample 4 and the optical property after each durability test were measured, respectively, and that result was summarized in Table 1.

[0042] [the example 2 of a comparison] -- G MONIUMU system compound of the commercial acrylic resin weight section and a near infrared ray absorbent: 20 (N, N, N', and N' -- a - tetrakis (p-diethylaminophenyl)-para benzoquinone-bis(potato NIUMU) hexafluoro antimonate --) Melting point 200 degree-C:0.07 The weight section, bis(dithio benzyl) nickel complex of a near infrared ray absorbent: It is a methyl ethyl ketone about the 0.07 weight sections. : The resin constituent which dissolved in the 79.84 weight sections A solvent is volatilized on a stainless plate by the cast method, and it is thickness. 50 It considered as the film of mum.

[0043] Subsequently, to this film, it is an ultraviolet ray absorbent ( TINUVIN 384 made from tiba SUPESHARUTI KEMIKARUZU). : The 2.7 weight sections, anti-oxidant (product made from tiba SUPESHARUTI KEMIKARUZU IRGANOX-1010) : 0.9 weight section, acrylic binder (Toagosei Aron S-1601) : 96.4 The thickness of a dry paint film the mixture which mixed and obtained the weight section 15 Coating was carried out and adhesion processing was performed so that it might be set to mum. About the adhesive face of the film which performed this adhesion processing, it is thickness by the roll laminator. It stuck on the 3mm tempered glass base material, and considered as the sample 5. The initial optical property of this sample 5 and the optical property after each durability test were measured, respectively, and that result was summarized in Table 1.

[0044] [the example 3 of a comparison] -- the commercial acrylic resin 100 weight section -- receiving - - G MONIUMU system compound of a near infrared ray absorbent: (N, N, N', and N' -- a - tetrakis (p-diethylaminophenyl)-para benzoquinone-bis(potato NIUMU) hexafluoro antimonate --) Melting point 200 degrees C : The 0.005 weight sections, bis(dithio benzyl) nickel complex of a near infrared ray absorbent: The 0.005 weight sections are added. Whenever [ cylinder internal temperature / of an injection molding machine ] It kneads to homogeneity as 220 degrees C, and is thickness by heating extrusion molding. It fabricated 4mm in the shape of a sheet, and this was made into the sample 6. The

initial optical property of this sample 6 and the optical property after each durability test were measured, respectively, and that result was summarized in Table 1.

[0045]

[Table 1]

No.	初期光学特性					耐光性評価		
	T(%)	H(%)	L*	a*	b*	T <sub>650</sub> (%)	T <sub>900</sub> (%)	T <sub>1000</sub> (%)
実施例1	65.6	2.6	83.8	0.2	-2.7	7	4	4
実施例2	66.1	1.2	84.1	-0.8	-2.6	7	3	4
実施例3	69.5	2.0	85.7	0	2.5	8	4	5
比較例1	58.4	2.0	78.6	-0.2	2.4	7	5	4
比較例2	63.0	2.1	81.4	-5.9	7.5	6	4	4
比較例3	74.8	1.1	88.9	-6.8	8.8	10	15	16

[0046] The result of the "evaluation result" table 1 shows that the sample 1 concerning an example 1 - an example 3 - a sample 3 all have advanced near infrared ray shielding property and light permeability and a good color-balance in an initial property. Moreover, it turns out that each variation [ each of ] of each optical property after each durability test is less than two points, and, as for the sample 1 concerning an example 1 - an example 3 - a sample 3, has practical endurance. Furthermore, it turns out that it has selective-absorption nature a sample 3 and focusing on 580 nm.

[0047] On the other hand, although the sample 4 in which the color tone amendment layer concerning the example 1 of a comparison is not prepared has advanced near infrared ray shielding property and a good color-balance in an initial property, light permeability is in it low, and things understand it, and it has the problem in practical endurance from the optical property change after each trial. Moreover, although the sample 5 in which the color tone compensation layer concerning the example 2 of a comparison is not prepared has advanced near infrared ray shielding property in an initial property, it is understood that light permeability is low and \*\* and a color-balance are bad, and has the problem in practical endurance from change of the optical property after moisture resistance and a radiationproofing test. Furthermore, although light permeability is high in an initial property, that a color-balance is bad understands the sample 5 in which the color tone compensation layer concerning the example 3 of a comparison and the ultraviolet ray absorbent content layer are not prepared to be near infrared ray shielding property, and it has the problem in practical endurance from change of the optical property after moisture resistance and a radiationproofing test.

[0048]

[Effect of the Invention] as mentioned above, with the near infrared ray electric shielding film concerning claim 1 by this invention A transparency resin film layer (1) and the transparency near infrared ray shielding layer which contains a G MONIUMU system compound as a near infrared ray absorbent (2), By having the multilayer structure which carried out the laminating of a transparency resin film layer (3) and the transparency color tone compensation layer (4) containing the color material which rectifies the color tone of said transparency near infrared ray shielding layer (2) While combining advanced near infrared ray shielding property and light permeability and excelling in the color-balance of a transparency color It has practical endurance and productivity is good, it uses for the light filter for plasma displays which covers the unnecessary light of a light field alternatively further, and may raise image quality, and a suitable near infrared ray electric shielding film is made.

[0049] With the near infrared ray electric shielding film concerning claim 2, for said G MONIUMU system compound, since it is the compound expressed with a general formula [-izing 1], molar extinction coefficient epsilon is about 10 to a near infrared ray field. It has the big absorbing power which is about 10,000, and light permeability is superior to other near infrared ray absorbents, and can use it suitably as a near infrared ray electric shielding film.

[0050] With the near infrared ray electric shielding film concerning claim 3, it is wavelength. The permeability of a 850-1000nm near infrared ray Below 10 % The average transmission coefficient of a visible ray It is L\* a\* b\* more than 65 %. The color tone in a color coordinate system by being -3 <=a\* <=3 and -3 <=b\* <=3 The malfunction prevention function of a peripheral device can fully be demonstrated, and it can be suitably used as a near infrared ray electric shielding film excellent in the color-balance.

[0051] By coming to carry out a laminating to this order, said transparency near infrared ray shielding layer (2), and said transparency resin film layer (3) and said transparency color tone compensation layer (4) have practical near infrared ray shielding property and light permeability, and the outstanding color-balance, and can constitute the near infrared ray electric shielding film excellent in endurance from a near infrared ray electric shielding film concerning claim 4. [ said transparency resin film layer (1), and ]

[0052] A glass transition point with the near infrared ray electric shielding film concerning claim 5 By being thermoplastics more than 70 \*\*, deterioration of a G MONIUMU system compound can be controlled and practical endurance can be raised. [ the resin which forms said transparency near infrared ray shielding layer (2) and/or said transparency color tone compensation layer (4) ]

[0053] With the near infrared ray electric shielding film concerning claim 6, when said thermoplastics is polyester system resin or acrylic resin, a suitable near infrared ray electric shielding film can be obtained in respect of the transparency of a transparency near infrared ray shielding layer (2) and a transparency color tone compensation layer (4), the solubility to a solvent, and coating nature.

[0054] With the near infrared ray electric shielding film concerning claim 7, the melting point of said G MONIUMU system compound By being 190 degrees C or more, lower deterioration can be controlled

whenever [ high-humidity/temperature ], it can combine with selection of a suitable resin kind, and practically good endurance can be acquired.

[0055] With the near infrared ray electric shielding film concerning claim 8, said color material is wavelength. By being the color material which absorbs the visible ray of 560 - 590 nm alternatively, the unnecessary light by neon gas luminescence from a plasma display can be intercepted, color purity can be improved, and image quality can be improved.

[0056] With the near infrared ray electric shielding film concerning claim 9, by having carried out the laminating of the transparence adhesive layer (5) containing an ultraviolet ray absorbent to both sides or one side of a near infrared ray electric shielding film according to claim 1, and having carried out the laminating of the mold releasing film layer (6) to it on it, while being able to stick a near infrared ray electric shielding film on a base material easily, deterioration of the G MONIUMU system compound by ultraviolet rays can be prevented, and lightfastness can be improved.

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[Translation done.]

## \* NOTICES \*

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

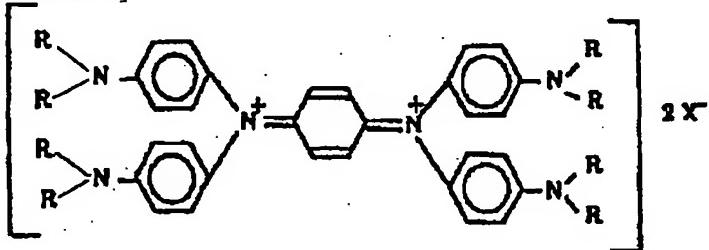
## CLAIMS

## [Claim(s)]

[Claim 1] The near infrared ray electric shielding film characterized by having the multilayer structure which carried out the laminating of a transparency resin film layer (1), the transparency near infrared ray shielding layer (2) which contains a G MONIUMU system compound as a near infrared ray absorbent, and a transparency resin film layer (3) and the transparency color tone compensation layer (4) containing the color material which rectifies the color tone of said transparency near infrared ray shielding layer (2).

[Claim 2] Said G MONIUMU system compound is a near infrared ray electric shielding film according to claim 1 characterized by what is expressed with the following general formula.

## [Formula 1]



(Anion with which R is the same or a radical chosen from the hydrogen which is different from each other, an alkyl group, an aryl group, a hydroxy group, a phenyl group, and an alkyl halide radical mutually among a formula, and X is chosen from perchloric acid ion, fluoride boron acid ion, hexafluoro arsenate, hexafluoro antimonic acid ion, trifluoroacetic acid ion, picric-acid ion, benzenesulfonic acid ion, phosphoric-acid ion, sulfate ion, and chloride ion)

[Claim 3] Wavelength The permeability of a 850-1000nm near infrared ray The average transmission coefficient of a visible ray below 10 % It is L\* a\* b\* more than 65 %. Near infrared ray electric shielding film according to claim 1 with which the color tone in a color coordinate system is characterized by being -3 <=a\* <=3 and -3 <=b\* <=3.

[Claim 4] The near infrared ray electric shielding film according to claim 1 with which said transparency near infrared ray shielding layer (2), and said transparency resin film layer (3) and said transparency color tone compensation layer (4) are characterized by coming to carry out a laminating to this order.

[ said transparency resin film layer (1), and ]

[Claim 5] A glass transition point Near infrared ray electric shielding film according to claim 1 characterized by being thermoplastics more than 70 \*\*. [ the resin which forms said transparency near infrared ray shielding layer (2) and/or said transparency color tone compensation layer (4) ]

[Claim 6] The near infrared ray electric shielding film according to claim 5 characterized by said thermoplastics being polyester system resin or acrylic resin.

[Claim 7] The melting point of said G MONIUMU system compound Near infrared ray electric shielding film according to claim 1 characterized by being 190 degrees C or more.

[Claim 8] Said color material is wavelength. Near infrared ray electric shielding film according to claim 1 characterized by being the color material which absorbs the visible ray of 560 - 590 nm alternatively.

[Claim 9] The near infrared ray electric shielding film characterized by having carried out the laminating of the transparency adhesive layer (5) containing an ultraviolet ray absorbent to both sides or one side of a near infrared ray electric shielding film according to claim 1, and carrying out the laminating of the mold releasing film layer (6) to it on it.

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[Translation done.]